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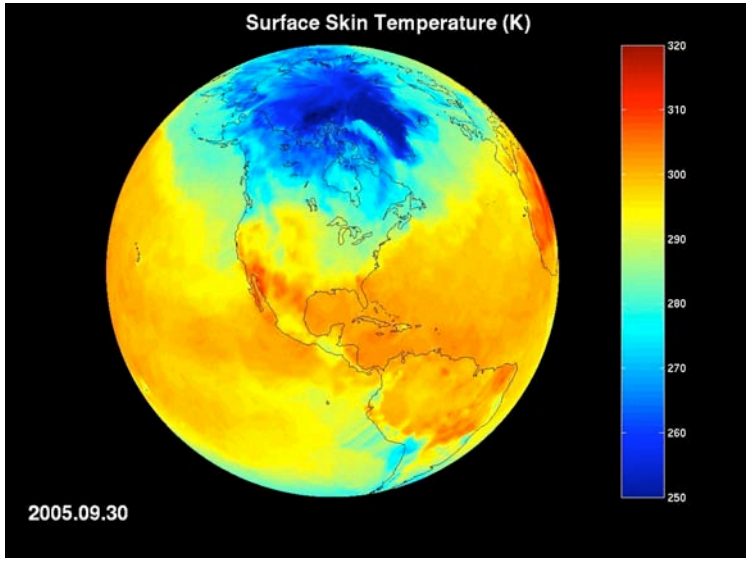
Pasadena, California

Proposed Changes to Level 3

AIRS Science Team Meeting
April 15-17, 2008



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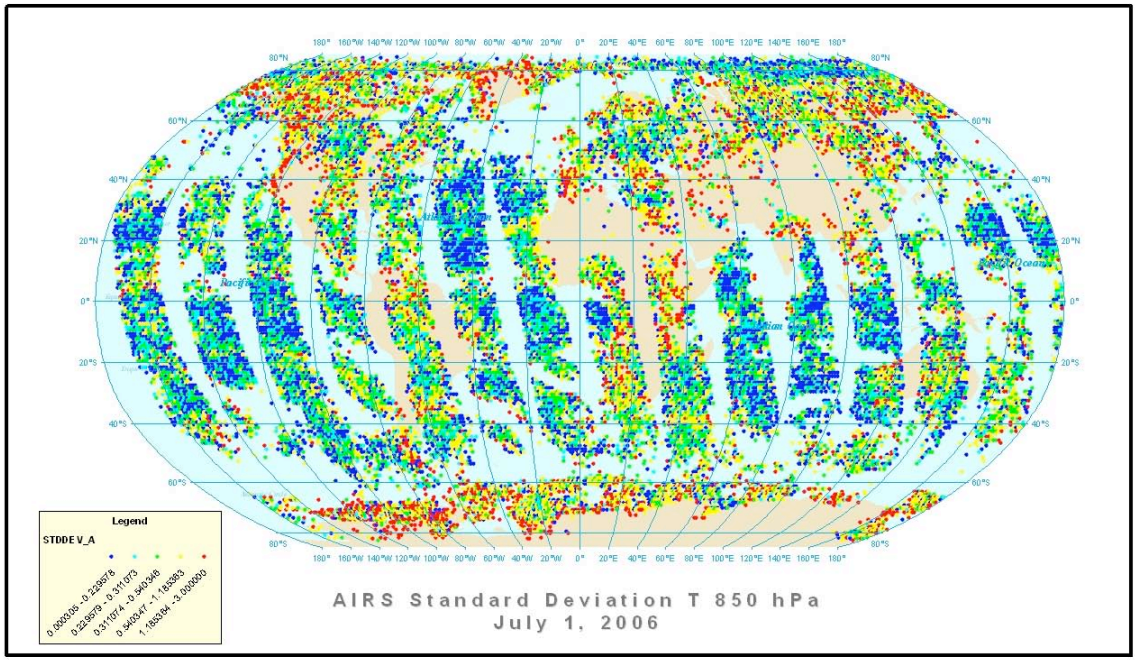
Introduction

- Background
- v5.0 Capabilities
- Science
- v6.0
  - Analysis
  - Updates



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What is Level 3?

CODMAC Data Levels*	
Level	*Description*
0	Reconstructed unprocessed instrument/payload data at full resolution; raw engineering measurements.
1	Reconstructed unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, computed and appended, but not applied, to the Level 0: processed tracking data.
2	Derived geophysical variables at the same resolution and location as the Level 1 source data.
3	Variables mapped on uniform space-time grid scales, usually with some completeness and consistency (observations from a single technology).
4	Model output or results from analyses of lower level data (i.e., variables derived from multiple measurements)

* Committee on Data Archiving and Computing

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AIRS Standard Level 3

- Spatially and temporally re-sampled from L2.
  - 1x1 degree
  - Gridded daily, 8-day and monthly products.
- Substantially lower in volume than L2.
- Easier to use.
- Enables inter-disciplinary global analysis of AIRS data.
  - Atmospheric dynamics
  - Climate variability and change
  - Hydrologic cycle

L3 Standard Product Characteristics		
Daily	*8-Day*	*Monthly*
"complex" data, leaves in gores between satellite tracks.	"moderate" data, no gores, some data dropouts	"simple" data, no gores, mostly complete coverage.
1°x1°	1°x1°	1°x1°
1-day temporal resolution	8-day temporal resolution (tied to Aqua repeat cycle)	Montlhy (calendar)

Temporal Range	AIRS Products	
	Level 2 Standard	*Level 3 Standard*
Daily	4.7 MB * 240 files = 1.1 GB	73M
8-Day	1.1 GB * 8 days = 8.8 GB	104M
Monthly	1.1 GB * ~ 30 days = 33 GB	105M

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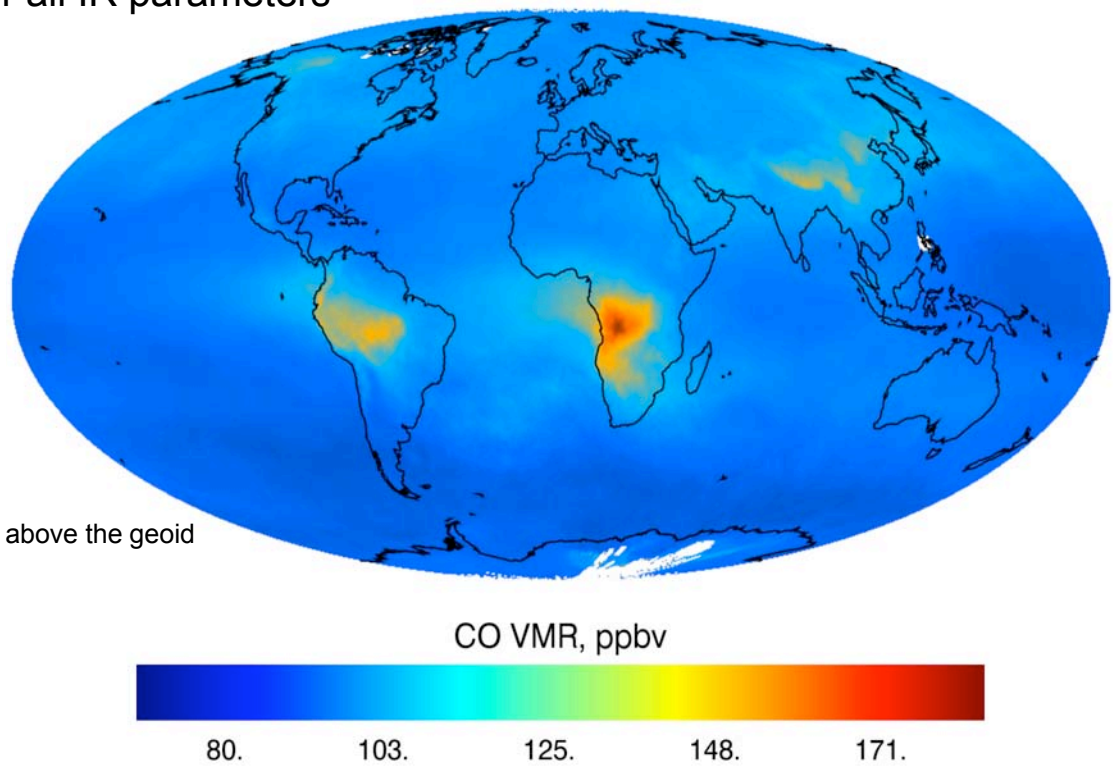
v5.0 capabilities delivered

- L3 Standard
  - New Parameters
    - Error estimates reported for all IR parameters
    - Trace gases
      - CH4
      - CO
    - Cloud Profiles
      - Fine
      - Coarse
    - Tropopause
      - T, P, Height (meters)
    - Relative Humidity Liquid
  - Location parameter
    - Topography (DEM)
      - Topography of the Earth in meters above the geoid
      - Source = PGS Toolkit
  - New Attributes
    - Trace gas support
- L3 Quantization
- L3 Support

Mean CO VMR

August 2005

~505 hPa



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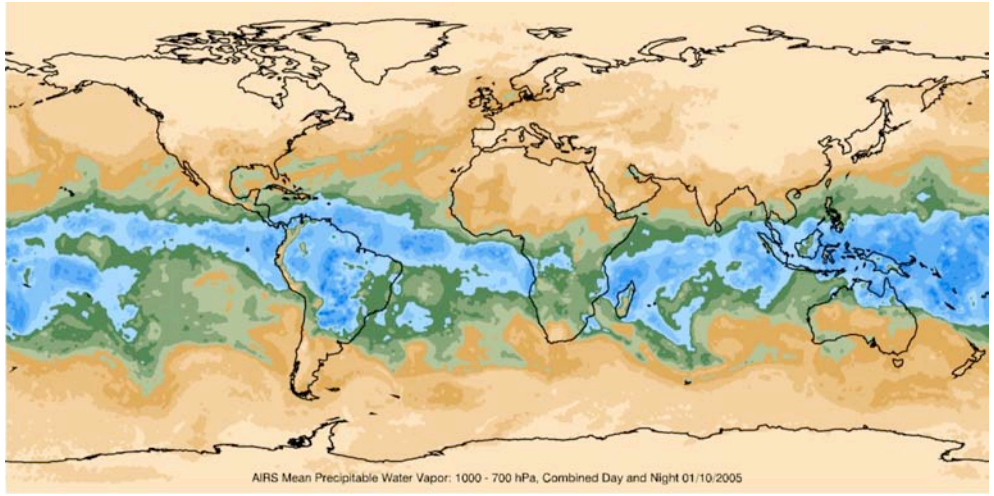
Science - Recent results

- Pierce, D. W., T. P. Barnett, E. J. Fetzer, and P. J. Gleckler (2006: Three-dimensional tropospheric water vapor in coupled climate models compared with observations from the AIRS satellite system. *Geophys. Res. Let.,* v. 33, L21701, doi: 10.1029/2006GL027060

- Tian, B., D. E. Waliser, and E. J. Fetzer (2006), Modulation of the diurnal cycle of tropical deep convective clouds by the MJO, *Geophys. Res. Lett.,* 33, L20704, doi:10.1029/2006GL027752.

- Ye, H., E. J. Fetzer, D. H. Bromwich, E. F. Fishbein, E. T. Olsen, S. L. Granger, S.-Y. Lee, L. Chen, and B. H. Lambrigtsen (2007), Atmospheric total precipitable water from AIRS and ECMWF during Antarctic summer, *Geophys. Res. Lett., 34*, L19701, doi:10.1029/2006GL028547.



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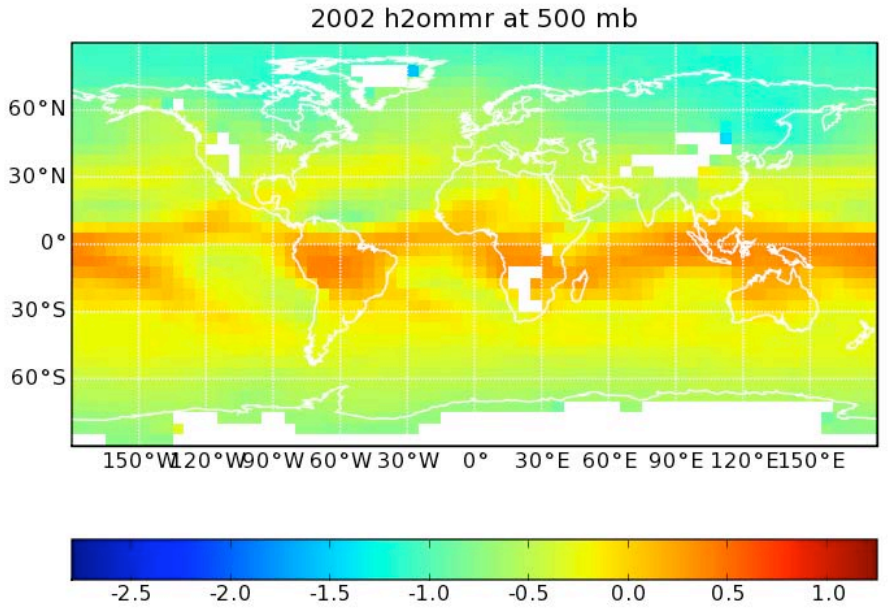
Research

- Validation
  - Enables validation relative to other people's products
- Trend analysis
- Comparisons
  - ECMWF
- Models
  - Understanding of variability key to parameterization of climate models
    - Enabled via AIRS L3 standard deviation

- Cloud studies
  - L3Q
- Societal impacts
  - GIS integration
    - Socioeconomic
    - Demographic



v6.0 Analysis of v5.0 L3

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Bias Assessment

- Vertical sampling
  - Keep entire profile.
- Different sampling per parameter
  - H2O and T correlated, but different
  - Uniform sampling.
- QC filtering
  - Surface Skin Temperature
    - Biased cold relative to NCEP
  - T profiles
    - Vertical lapse rate between 300 and 500 hPa
    - Day, night: diurnal difference
  - Clouds
  - Water Vapor
    - Comparisons with L3 ECMWF (monthly, octads)

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Liens - Bias characterization

Level 3 Working Group (Fetzer, Braverman, Manning, Granger)

- Sampling Issues
  - Representativeness
  - Sampling bias
- Alternative methods of binning/gridding
  - Asynoptic mapping (Salby's method)
  - Cloud fraction
  - Cloud type
- Filling missing regions in the monthly product
  - Climatology
    - Fill (Level 4)

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Liens - Bias Characterization

Sampling Issues

- Always have sampling bias
  - Best to characterize (measurement determined)
  - First step - T and WV characterization
    - WV helps to understand O3 and minor gases
- Part of validation
  - Comparisons to correlative sources

Liens - Bias Characterization

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Alternative methods of binning

- Simple binned average
- In-line w/other EOS gridded products (e.g., MODIS)
  - "no single, sophisticated gridding algorithm that satisfies every user's need" (QuickSCAT L3 document)
- Known problems
  - Temporal variation ignored (spatial-only)
  - Data gaps (holes)
- Possible solutions
  - Kalman filtering
    - Computationally intensive
    - Code in-hand
  - Salby's method
    - Computationally intensive
    - Variation implemented for UARS-MLS
    - Not well suited for water vapor from instruments at varying times.
- Conduct trade-off study

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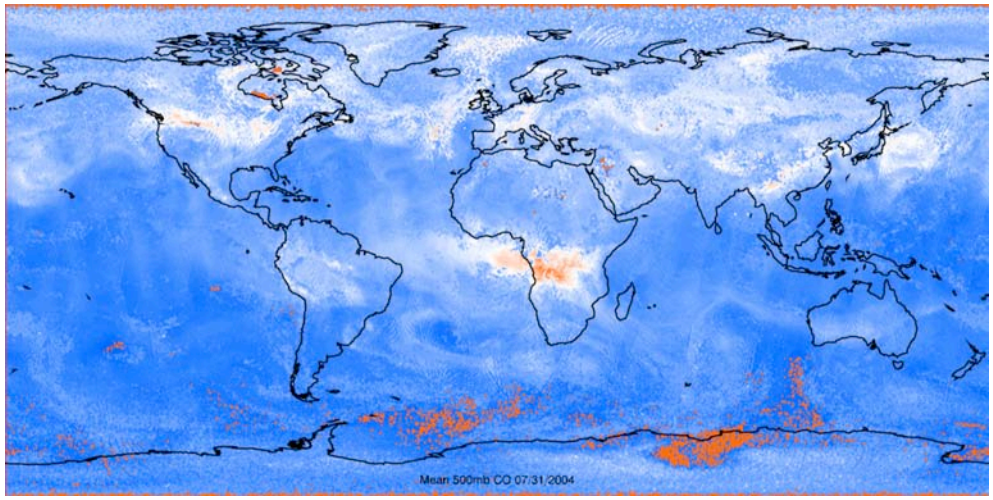
Proposed New/Updated Products

- L3 Standard
  - Extend L3 Standard for new L2 products
  - O3
    - Profiles
    - Levels TBD
  - IR Emissivity
  - Higher resolution
    - More channels
  - CO (Higher resolution)
  - Match climate observables
    - Monthly mean cloud ice fraction
    - Cloud fraction & cloud top temp using ISCCP definitions
  - Gridding
    - Artifacts
      - Polar regions
        - Pseudo Equal-Area gridding in polar regions
      - Bi-directional reflectivity
        - Feature over ocean
- L3 Quantization
  - Clouds
  - Surface emissivity
  - Minor constituents
  - Cluster co-variance matrix
- L4 products
  - Climatology
    - Gaps filled via TBD method



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Thank you

Questions?